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ABSTRACT

Varied views are presented in this report which addresses five primary issues: (1) What is computer literacy? (2) What does it cover? (3) Who is it for? (4) How should it be presented? and (5) Where can one get help in organizing a computer literacy program? The first section summarizes results of a survey of 14 educators who were asked their opinions on what elements should be included in a computer literacy program, how early such education should begin for students and teachers, and how such programs should be evaluated. A list of the survey respondents, a summary of each individual's views, and the computer literacy program features they emphasized are included. Focusing on activities in New York State, the second section outlines State Education Department activities in computer literacy and presents a statement by the Subcommittee on Computer Literacy of the Statewide Instructional Computing Network, which is designed to serve as a multi-level instructional guide for school districts. Also included are a sample of computer literacy activities in schools, a description of a computer awareness kit, and a model for computer education. The remainder of the publication, which is not reproduced here but available as noted, contains prints and abstracts of recent articles on computer literacy and programs, and two bibliographies. (LMM)

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COMPUTER LITERACY: AN INTRODUCTION

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1988 SALVATORE J. SCLAFANI, B.A., M.D. ---------- Staten Island
1989 MIMI LIEBER, B.A., M.A. ---------- New York
1985 SHIRLEY C. BROWN, B.A., M.A., Ph.D. ---------- Albany
1983 ROBERT M. BEST, B.S. ---------- Binghamton

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ROBERT J. MAURER

Executive Director, Adult Learning Services
NORMAN KURLAND

Center for Learning Technologies

Chief, Bureau of Educational Communications
RAYMOND W. GRAF

Chief, Bureau of Mass Communications
BERNARR COOPER

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FOREWORD

What is computer literacy? What does it cover? Who is it for? How should it be presented? Where can I get help in organizing a computer literacy program? If you have been asking these questions and not getting good answers, this report is for you. In it we have assembled a number of items that give a variety of viewpoints on these questions. The intention is not to give definitive answers -- for there are none yet in this field -- but to make readily available a small collection of useful materials to help schools in defining what they want computer literacy to be.

The first section includes many items that have not previously been published. They report a survey of views on computer literacy, and indicate some ongoing activities in New York State. The remainder of the publication contains reprints and abstracts of some of the most thoughtful recent articles on computer literacy and materials on computer literacy programs in a few places around the country. Two bibliographies are provided at the end.

This publication has been prepared as one response of the New York State Education Department (SED) to the growing interest everywhere in the use of computers in education. It is made possible by New York's membership in the Northeast Regional Exchange (NEREX), a project funded by the National Institute of Education. SED chose to use its share of the funds allocated for its use to produce this publication.

A second SED response was the establishment of the Center for Learning Technologies (CLT). One of the objectives of CLT is to promote computer literacy throughout the State. This publication will be the first of many efforts in this direction.

ACKNOWLEDGMENTS

The people who have helped put this collection together are:

Dorothy M. Foley, Chief, Bureau of General Education Curriculum Development

Robert Carruthers, Associate, Bureau of General Education Curriculum Development

Robert M. Trombly, Coordinator, Educational Programs and Studies Information Service

Amy J. Doran, Assistant, Bureau of Educational Communications

Gerard Burke, Director of Computer Instruction, Half Hollow Hills School District, Melville, New York 11747

Richard Purga, Consultant

Mr. Carruthers prepared the manuscript for publication.

I. COMPUTER LITERACY: A SURVEY

I. COMPUTER LITERACY: A SURVEY

by Richard Purga

In connection with the New York State Education Department -- NEREX Computer Literacy project, people active in computer education were contacted to obtain their views on computer literacy. (See Attachment A for the list of persons contacted.) The following report and two charts (Attachments B and C) summarize their views.

Each person contacted was asked to respond to the following three questions:

1. What elements should be included in a computer literacy program?
2. How early should computer literacy education begin for students and teachers?
3. How should computer literacy outcomes be evaluated?

1. What should be included in a computer literacy program?

a. Hands-on experience

All those canvassed stated that hands-on experience with a computer was the most important of the many possible features of a program of computer literacy. There was no consensus on the proportion of the program that should be devoted to hands-on experience. However, most of the persons agreed that there should be opportunities both for programming and for applications.

One person urged the use of a computer in an interactive learning mode in which a student would interact with highly responsive, individualized, graphic programs that would demonstrate the capabilities of a computer. Another person would use the hands-on experience to teach the use of the computer in problem-solving, and use both programming and applications for this purpose.

A third person maintained that programming or "pseudo-programming", e.g., word processing, was essential and that it was crucial to demonstrate to students the full range of technological capabilities of the computer, including graphics and sound. A fourth argued that programming was the most critical element of a program of computer literacy.

b. Computer awareness

Most of the persons recommended, with differing degrees of emphasis, that students become aware of the social impact of computers, the

history of computers, and information on computer hardware. Two of the people felt that these topics should be labeled "computer awareness" rather than computer literacy, and that by themselves they would not be enough to achieve what these persons consider to be computer literacy.

c. Other elements

The persons canvassed mentioned several other possible components of a program of computer literacy: computer-related career opportunities; attention to the demands of high technology; consultation with people from industry in formulating a relevant program of computer literacy; and the inclusion of fiction about computers as a preview of future developments in the use and capabilities of computers.

2. How early should computer literacy begin?

a. For students

The majority of the persons stated that some form of instruction in computer literacy should be started as early as possible. Two suggested that preschool children could benefit from experience in using computers; four suggested that students should begin using computers in either kindergarten or first grade. One person opted for beginning formal instruction in computer literacy in the fourth grade; another chose the fourth through the sixth. Four of the persons would hold off such instruction until junior high school.

An important issue is whether to have a separate course in computer literacy or to integrate computer literacy with other subjects. Most of the persons felt that students should have some direct exposure to a program of computer literacy; however, none were opposed to a broad exposure to computers throughout the curriculum.

For the introduction of computer literacy, one person suggested using a developmental approach based upon Piaget's research. A second person recommended focusing on awareness activities involving computer-assisted instruction and computer games which stimulate the interest of elementary school children.

A third person commented that simple programming concepts such as controlling programmable toys, the LOGO language, and graphics could be presented in the third or fourth grades.

b. For teachers

Most of the persons canvassed stated that the training of teachers to be computer literate was a key requirement for education in computer literacy. One person stated that direct experience with a computer was essential for teachers to get a feeling of the computer as a learning tool. This person noted that teachers and administrators must be at the forefront in establishing education in

computer literacy in educational institutions.

For a second person, teacher training should be the central concern of education in computer literacy. This person labeled this a "destructive problem" in the sense that when teachers become computer literate, they are less likely to continue in the teaching profession because of the relatively low salary levels in schools as compared with positions in the computer industry.

There was a consensus that education in computer literacy should be required as part of the preservice curriculum in teacher education and that computer literacy should be a requirement for graduation.

Two of the persons believed that preservice training should involve two components: (1) a general knowledge of computers that any student should acquire to be computer literate; and (2) a level of professional competency in the use of computers in the teacher's major field. A third person added that applications of computers should not be limited to computer science courses but should be included in each major area of interest, and that applications should be integrated with each discipline.

A fourth person added a third focus - the need for special preparation for those teachers who plan to teach computer courses in the schools.

No person canvassed suggested how the colleges and universities could provide all of this preparation if they could not get qualified faculty. It was perhaps for this reason, as well as the need to help current teaching staffs become computer literate, that all the persons urged intensive inservice programs in computer literacy.

Several persons suggested that because of the problem of finding qualified instructors within the traditional system, inservice workshops might be offered by firms that specialize in such workshops, by companies that manufacture computers or produce software, and by agencies such as the Minnesota Educational Computing Consortium (MECC), state education departments, and regional consortia such as the Board of Cooperative Educational Services (BOCES) and NEREX.

3. How should computer literacy outcomes be evaluated?

The persons canvassed overwhelmingly agreed that basic competencies in computer literacy should be evaluated. There was a consensus that the basic competency to be measured should be problem-solving. Students should be able to use a computer as a tool to solve problems in various subjects. The emphasis should be on performance, not just on knowledge about computers. This emphasis is consistent with the importance that the persons placed on hands-on experience. One person added that performance tests could be supplemented by evaluation of programs written by students.

Two persons suggested the use of traditional pre- and post-tests of the kind developed at MECC to measure cognitive and affective objectives. A third argued that these tests are not adequate to evaluate computer literacy because of MECC's emphasis upon attitudinal outcomes, which are not skill-oriented. Instead, this person would base evaluation of computer literacy upon performance in using computers.

Two other persons indicated that evaluation would depend on what is emphasized in a curriculum in computer literacy. For assessment of programming, one person stressed the problem-solving approach and the student's ability to write programs. Two of the persons agreed that a survey instrument could be used for the evaluation of affective outcomes.

4. Conclusion

It was not our intention to seek from these persons a definitive computer literacy program. Rather, we sought ideas on a few major questions that those constructing computer literacy programs would confront. By identifying areas of broad agreement -- such as the emphasis on hands-on experience -- and areas where there is a divergence of expert opinion, such as when to begin formal computer literacy programs -- this report can be helpful to those who are trying to produce computer literacy programs. We are all groping for approaches in an area that is developing faster than almost any field ever has. Every person working in the field is, therefore, both novice and expert. This report and the other materials in this volume should help everyone become a little more expert.

ATTACHMENT A

Karen Billings
Teachers College
Columbia University
New York, NY

Alfred Bork
Educational Technology Center
University of California
Irvine, CA

Ludwig Braun
Dept. of Technology and Society
College of Engineering and
Applied Sciences
SUNY at Stony Brook
Stony Brook, NY

Thomas P. Hansen
Educational Computing Consultant
Barrington, NH

Dan Isaacson
Dept. of Information Systems
and Decision Sciences
California State University
Fresno, CA

Dan Klassen
Saint Olaf College
Northfield, MN

Arthur Luehrmann
Computer Literacy, Inc.
Berkeley, CA

Andrew R. Molnar
Research Science Education/
SEDR
National Science Foundation
Washington, DC

David Moursund
Dept. of Computer and
Information Science
University of Oregon
Eugene, OR

James Poirot
Computer Sciences Dept.
North Texas State University
Denton, TX

Robert Seidel
Human Resources Research
Organization
Alexandria, VA

Robert Taylor
Teachers College
Columbia University
New York, NY

Dan Watt
Technical Education Research
Centers (TERC)
Cambridge, MA

Karl Zinn
Computer Center
University of Michigan
Ann Arbor, MI

ATTACHMENT B
SUMMARY OF VIEWS

Person	Beginning Student C.L. Education	Formal Student C.L. Education	Teacher C.L. Education	Evaluation of Student C.L.
Billings	Kindergarten		Part of curriculum at teachers college; also nontraditional methods including computer conferences, publisher workshops and inservice training	Problem-solving approach is evaluated on student's ability to use a computer as a tool to solve problems in various subjects and applications
Bork	Letter did not address this issue	Letter did not address this issue	Letter did not address this issue	Letter did not address this issue
Braun	Kindergarten	Kindergarten with changing emphasis each year	Central issue: new cost-effective approaches; develop certification	
Hansen	1st Grade	4th Grade	Part of curriculum at teachers college; inservice training	Problem-solving approach; pre- and post-tests
Isaacson	Preschool		Part of curriculum at teachers college	Problem-solving approach; student should be able to demonstrate the ability to operate a computer terminal and to program
Klassen	3rd or 4th Grade	Junior High	Part of curriculum at teachers college; approach inservice training in same way as with beginning students	Assessment tests
Luehrmann		Junior High	Inservice training more important than preservice due to present hiring field, i.e., few teachers will be hired because of declining enrollments; hence, inservice is vital	Evaluate on what students demonstrate in using the computer; less emphasis on assessment tests

ATTACHMENT B

SUMMARY OF VIEWS

Person	Beginning Student C.L. Education	Formal Student C.L. Education	Teacher C.L. Education	Evaluation of Student C.L.
Molnar	Unclear; Programming as early as possible	3rd Grade	Part of curriculum at teachers college; inservice training should be system-wide	Too early to establish sets of goals and objectives
Moursund	1st Grade		C.L. requires general knowledge of computers plus C.L. competency in field of specialty	Problem-solving approach
Poirot	Kindergarten	Junior High	Two levels of C.L. for teachers: 1) general knowledge of computers as teaching aids; and 2) teaching C.L. as a subject in itself, i.e., preparing a teacher as a computer professional	Problem-solving approach
Seidel	Early as possible using developmental approach per Piaget	Junior High	Part of curriculum at teachers college	Problem-solving approach
Taylor	Preschool		C.L. requires general knowledge of computers plus C.L. competency in field of specialty	Survey method; before and after additional survey; possible problem-solving approach
Watt	As early as possible		Part of curriculum at teachers college	Too early to establish sets of goals and objectives for evaluation
Zinn	As early as possible	Grades 4-6; programming introduction in 7th Grade	Part of curriculum at teachers college	Computer applications assessed by performance evaluations; awareness issues evaluated by objective tests; programming by grades on programs completed

ATTACHMENT C

COMPUTER LITERACY PROGRAM FEATURES EMPHASIZED

Person	Hands-on Experience	Computer Applications	Computer Programming	Social Impact of Computers	History of Computers	Information on Hardware	Information on Computer-Related Careers	Fiction About Computers
Billings	X	X		X				
Bork	X		with newer structured languages	X				
Braun	X	X	X	X	X	X	X	include with care
Hansen	X	X	X	X	not crucial	X		
Isaacson	X	X	X	X	not crucial			
Klassen	X	X	X	X	X	X		
Luehrmann	X		X	*	*	*	X	
Molnar	X	X						
Moursund	X			X	X	X		
Poirot	X	X	X	X	X	X	X	X
Seidel	X	X	X	X		X	X	X

ATTACHMENT C

COMPUTER LITERACY PROGRAM FEATURES EMPHASIZED

Person	Hands-on Experience	Computer Applications	Computer Programming	Social Impact of Computers	History of Computers	Information on Hardware	Information on Computer-Related Careers	Fiction About Computers
Taylor	X		X					
Watt	X	X	X	*	*	*		
Zinn	X	X	X	X	X	X	X	X

* By themselves not sufficient; must be part of more comprehensive program. Given alone are only "computer awareness".

II. ACTIVITIES IN NEW YORK STATE

II. ACTIVITIES IN COMPUTER LITERACY IN NEW YORK STATE

A. The State Education Department

1. Regular Activities

The New York State Education Department has encouraged computer literacy through activities such as:

a. Approving courses of study: Since 1970, over 30 courses entitled, "Computer Literacy," and at least 30 others in computer programming, computer science, and computer mathematics have been approved by the Bureau of General Education Curriculum Development and appropriate subject bureaus.

b. Changing curriculum: The State curriculum in mathematics is being revised with the recommendation that students in grades 7 and 8 have experiences involving computers. Also, the Bureau of Business Marketing and Distributive Education has published a new Computer Literacy module for use in all business education classes.

c. Providing technical assistance to schools: Various bureaus of the Department have conducted workshops for administrators, teachers, and parents about the use of computers in education.

d. Cooperating with the State Legislature: In 1981 and 1982, Senator James Donovan (Oneida County) sponsored a Technology Fair at the Legislative Office Building in the Empire State Plaza near the State Capitol in Albany. Staff of several bureaus of the Department suggested speakers and other participants and aided in planning the programs for the Fair.

e. Cooperating with the Subcommittee on Computer Literacy of the Statewide Instructional Computing Network: Staff of the Department have assisted in the creation of the Statewide Instructional Computing Network and are providing ongoing support to its work.

f. Providing a clearinghouse of information on activities in New York State in computer literacy: The new Center for Learning Technologies will also provide this service through its main office and/or contacts with appropriate bureaus of the Department.

2. Computer Literacy Materials Acquisition Project

In November 1981, the State Education Department, in cooperation with local school districts and the District Superintendents, undertook the Computer Literacy Materials Acquisition Project. The purpose of the Project was to collect outstanding materials produced by school districts for possible publication and dissemination to the schools of New York State. The process of identifying and collecting the materials involved several steps. First, Department personnel developed criteria which the materials needed to meet, sent them to the District Superintendents and local chief school officers, and conducted several regional workshops regarding the screening process. The latter linked the following in this order: school building; school district; BOCES; Joint Management Team (from more than one BOCES); and the State Education Department. In each step of the screening process, outstanding materials were selected for forwarding to the next higher level. Finally, the State Education Department will select from the outstanding materials those that are worthy of publication. Thus the product of the Project will reflect outstanding practices in computer literacy in representative schools of New York State.

To date, more than 90 materials have been sent to the State Education Department for final screening. These materials are as follows: statements/position papers; curriculum guides; courses of study; units; inservice programs; posters/information sheets/ newsletters; questionnaires; tests; videotapes; articles; miscellaneous (glossary, catalog, etc.)

As soon as final screening of the materials has been completed, the Department will prepare the outstanding materials for publication to assist schools in developing programs of computer literacy.

3. Inservice Course for Department Staff

Outline for Course in Microcomputers
Instructors: David Rees and John Stebbins
Duration: Five class sessions, four hours each

I. Objectives:

A. To understand microcomputer terminology and procedures found in schools.

B. To understand BASIC as a microcomputer language and logic system.

C. To evaluate schools' involvement in the use of microcomputers.

D. To have hands-on experiences with microcomputers.

II. General Topics Covered:

A. Introduction to nomenclature of microcomputer

1. Hardware - micro, mini, mainframe, terminal
2. Software
   languages - machine, assembly, BASIC, COBAL, FORTRAN

B. General uses for microcomputers

1. Instructional/data management

C. Flowcharting as a way to understand computer logic as a basis for programming

D. BASIC as a language and its variations

1. Dartmouth BASIC
2. TRSDOS
3. Newdos 80 Level I & II
4. VTOS, etc.

E. General terms

1. Chips
2. Online
3. Memory
4. RAM
5. ROM, etc.

F. Program design

G. Data storage

1. Memory
2. Hard disks
3. Cassettes
4. Diskettes
5. Numeric/alphabetic storage
6. Raw data storage

H. Input/output

1. Keyboard
2. Cassette, diskette
3. Printers (all types)
4. Video
5. Video and laser disks
6. Voice synthesizers/ commands

I. Elements of writing programs

J. Sources of programs

1. Commercial (utility, self-contained, educational, business)
2. Magazines
3. Books
4. Contract-written
5. Self-written
6. Student-written

K. Sources of hardware

1. Major brands
2. Smaller supplies of peripheral equipment

L. Telecommunications

1. Modems/RSZ32C interface
2. Tie lines
3. "Source"
4. "Micronet"
5. ST80 II
6. SED: present involvement

M. General questions and answers

III. Experiences Provided:

A. Running of Agenda program
B. Completing "Why Do You Smoke?" questionnaire
C. Analyzing a specific program
D. Attending demonstrations of
   1. Visicalc (computation/prediction)
   2. Profile (data management)
   3. Scripsit (word processing)
   4. Micronet (telecommunications)
E. Writing and debugging own program
F. Reviewing school-developed materials

IV. Homework Assignments:

A. Analysis of program
B. Writing or modifying a short, sample program

V. Handout Materials

VI. BASIC Programming

II.B. STATEWIDE INSTRUCTIONAL COMPUTING NETWORK: STATEMENT BY THE SUBCOMMITTEE ON COMPUTER LITERACY

The Network is composed of representatives from many school districts in New York State. Its purpose is to foster and cultivate the effective use of computers in education throughout the State. Thus, the Network seeks to improve the quality of learning and instruction by assisting in the planning, implementation, evaluation, and general dissemination of information on the subject of computer-based instruction. The Subcommittee on Computer Literacy makes recommendations concerning computer literacy to the Steering Committee of the Network.

Definition: Computer Literacy is an awareness and understanding of the operational and analytical aspects of computers and their applications and limitations.

Course of Study: Preamble: The following outline can serve as an instructional guide for districts throughout New York State. It is applicable to various grade levels, and is meant to serve the general student population. It is designed to help reduce the resistance to computers and to narrow the gap between the computer specialist and the uninitiated. The Subcommittee made considerable use of a paper entitled, "A Conceptual Framework for Developing Computer Literacy Instruction," by R.E. Anderson and D.L. Klassen.*

A. Operational

1. Know the names of the major components -- that is: keyboard, monitor, storage unit, processor, etc.
2. Know how each major component works together with other parts of the computer system.
3. Be able to operate a computer.

B. Analytical

1. Analyze tasks to determine appropriateness of use of a computer.
2. Understand the structure of algorithms and programs.
3. Use algorithms and programs to make computers do work.
4. Recognize that the work of a computer is done by the processing of data that includes such processes as: searching, sorting, deleting, updating, summarizing, moving, comparing, storing, etc.

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*See pages 41-52 of the present publication.

5. Recognize that the power of computers derives from their capacity to follow instructions accurately and to access data at tremendous speeds.

C. Applications

1. Recognize the varied use of computers in both work and a person's life.

2. Recognize that the following are some common types of computer applications, and be able to give an example of each type:

   a. information storage and retrieval - record keeping, databases, etc.

   b. simulation and modeling

   c. process/machine control - robotics

   d. computation (numerical/statistical analysis of data)

   e. data processing

   f. word processing

   g. graphics

   h. sound synthesis

   i. artificial intelligence

   j. decision-making

3. Recognize that computers are generally useful for information processing tasks which require any of the following:

   a. handling large amounts of information

   b. rapid handling of information

   c. accuracy

   d. repetition

   e. the storage of information in an accessible form

4. Recognize that innovations in computer hardware and software continually expand the potential utility of the computer.

5. Determine some general criteria for computer usage for a particular task (e.g., purpose, time and resource constraints, ethical or moral considerations, relevance).

D. Limitations

1. Distinguish between human capabilities and computer capabilities.

2. Recognize the positive and negative consequences of computer use.

3. Understand the sources of related errors and abuses and how to cope with them.

The following members of the Subcommittee on Computer Literacy developed the above Statement:

H. Clay Bishop
Chairman
Washington/Warren Co. BOCES

Paul Bowler
Rensselaer/Columbia/Greene Co. BOCES

James Monk
Superintendent
Brewster Central Schools

Norman Kurland
Executive Director
Adult Learning Services
State Education Deptartment

NOTE: The above Network is independent of the State Education Department, but works with it regarding computers. The Statement has been adopted by the Network, but has not been reviewed by the Department.

II.C. ACTIVITIES IN SCHOOLS

The following pages contain a sample of activities in computer literacy in schools in New York State.

Computer Literacy Curriculum Guide K-12*

Written by:

Celia Keenholtz, Greenburgh CSD#7
Dennis Lauro, Mahopac CSD
Michele Marchetti, Yorktown CSD
Donald Ross, Ardsley UFSD

Computer Awareness

I. Knowledge of the difference between hardware and software.

   A. Students will be able to successfully identify computer hardware.

      1. Microcomputers
      2. Minicomputers
      3. Remote terminals

   B. Students will be able to demonstrate an understanding of software.

   C. Students will be able to demonstrate an understanding of how data is stored in a computer.

II. Knowledge of the use of computer hardware, including hands-on experiences.

   A. Students will be able to turn equipment on/off.

   B. Students will be aware of minimal troubleshooting techniques.

   C. Students will be able to load software into the computer system.

   D. Students will be able to demonstrate proficiency at the keyboard.

   E. Students will be able to demonstrate the use of storage devices.

      1. Cassette tapes
      2. Diskettes

---

*See also Attachment A, pages 23-25.

III. Knowledge of the use of computer software.

A. Students will be able to interact successfully with a variety of programs.

B. Students will be able to make minor modifications of existing programs.

IV. Knowledge of career opportunities involving computer technology.

A. Students will be able to access career and employment information, using computerized guidance information systems.

B. Students will be able to cite examples of computer applications in business, industry, and education.

V. Knowledge of social and ethical implications of computer technology.

A. Students will demonstrate an understanding of the evolution of computing systems.

B. Students will be able to describe both beneficial and harmful effects of computer applications, i.e., problems of privacy, computer crime, etc.

C. Students will be able to demonstrate an understanding of ethical principles in the use of computerized information systems, i.e., respect the privacy of personal and privileged information.

Computer Programming

I. Ability to create successful programs appropriate to the student's grade level.

A. Students will be able to determine whether or not a problem is suitable for computer solution.

B. Students will be able to create elementary BASIC programs involving:

1. The concept of a variable
2. System commands
3. Input techniques
4. Output techniques
5. Unconditional branching
6. Conditional branching
7. Debugging techniques

C. Students will have an opportunity to elect a beginning BASIC Programming course covering:

1. Review of elementary BASIC concepts
2. The use of strings
3. The use of decision-making and looping statements, i.e., FOR/NEXT
4. Further debugging techniques
5. Singly subscripted variables
6. Use of built-in functions
7. Logical statements
8. Subroutines

D. Students will have an opportunity to elect an advanced BASIC programming course covering:

1. Subscripted variables
2. Substrings
3. Additional output formats
4. Files (sequential and random access)
5. Graphics

E. Students will have an opportunity to elect an additional programming course covering:

1. Advanced problem-solving techniques
2. Assembly and/or machine language programming
3. Other high level languages, i.e., APL, FORTRAN, PASCAL, COBOL, PL 1, RRG, etc.

II. Ability to utilize various peripheral devices for programming purposes.

A. Students will be able to format output using a printer.
B. Students will be able to create, store, and access data files using a DOS.
C. Students will be able to demonstrate successful use of a word processing system.
D. Students will be able to access a communications network system through a remote terminal, i.e., GIS, etc.
E. Students will have the opportunity to visit computer installations having varied applications.

Staff Inservice Education

I. To acquire a functional knowledge of computers for educational use.

A. Teachers will acquire the necessary knowledge to differentiate between hardware and software.

B. Teachers will acquire the necessary skills to operate computers through hands-on experiences.

C. Teachers will acquire the necessary skills to determine whether a problem is suitable for computer solution.

II. To learn how to integrate computers into the learning environment.

A. Teachers will develop the ability to evaluate available software to determine its appropriateness for classroom use.

B. Teachers will be able to use available software to augment classroom instruction.

C. Teachers will develop the ability to use peripheral devices such as printers, monitors, and disk drives to enhance the use of software in the classroom.

III. To develop the necessary programming skills to facilitate creation of software suitable for classroom use.

A. Teachers will acquire the ability to modify existing programs to fit classroom needs.

B. Teachers will demonstrate an understanding of the programming process in order to work in concert with a programmer to develop computer-assisted learning programs.

IV. To acquire the knowledge necessary to teach principles of computer awareness.

A. Teachers will acquire an awareness of computer-related literature and other media, i.e., books, periodicals, filmstrips, etc.

B. Teachers will acquire a knowledge of career opportunities involving computer technology.

C. Teachers will acquire a knowledge of the social, ethical, and historical implications of computer technology.

ATTACHMENT A

Grade Level	Computer Awareness	Computer Programming
K-3	II. Knowledge of the use of computer hardware including hands-on experiences. A. Students will be able to turn equipment on/off. C. Students will be able to load software into the computer system. III. Knowledge of the use of computer software. A. Students will be able to interact successfully with a variety of programs.	
4-6	I. Knowledge of the difference between hardware and software. A. Students will be able to successfully identify computer hardware. B. Students will be able to demonstrate an understanding of software. II. Knowledge of the use of computer hardware including hands-on experiences. B. Students will be aware of minimal troubleshooting techniques. D. Students will be able to demonstrate proficiency with the keyboard. E. Students will be able to demonstrate the use of storage devices. 1. Cassette tapes IV. Knowledge of career opportunities involving computer technology. B. Students will be able to cite examples of computer applications in business, industry, and education.	

ATTACHMENT A

Grade Level	Computer Awareness	Computer Programming
7, 8, 9	I. Knowledge of the difference between hardware and software. C. Students will be able to demonstrate an understanding of how data is stored in a computer. II. Knowledge of the use of computer hardware including hands-on experiences. E. Students will be able to demonstrate the use of storage devices. 2. Diskettes III. Knowledge of the use of computer software. B. Students will be able to make minor modifications of existing programs. V. Knowledge of the social and ethical implications of computer technology. A. Students will demonstrate an understanding of the evolution of computing systems. B. Students will be able to describe both beneficial and harmful effects of computer applications, i.e., problems of privacy, computer crime, etc.	I. Ability to create successful programs appropriate to the student's grade level. A. Students will be able to determine whether or not a problem is suitable for computer solution. B. Students will be able to create elementary BASIC programs involving: 1. The concept of a variable 2. System commands 3. Input techniques 4. Output techniques 5. Unconditional branching 6. Conditional branching 7. Debugging techniques
10, 11,12	IV. Knowledge of career opportunities involving computer technology. A. Students will be able to access career and employment information using computerized guidance information systems.	I. Ability to create successful programs appropriate to the student's grade level. D. Students will have an opportunity to elect an Advanced BASIC Programming course covering: 1. Subscripted variables 2. Substrings 3. Additional output formats 4. Files (sequential and random access) 5. Graphics E. Students will have an opportunity to elect an additional programming course covering: 1. Advanced problem solving techniques 2. Assembly and/or machine language programming 3. Other high level languages, i.e., APL, FORTRAN, PASCAL, COBOL, PL1, RRG, etc.

ATTACHMENT A

Grade Level	Computer Awareness	Computer Programming (Continued)
10, 11, 12		II. Ability to utilize various peripheral devices for programming purposes. A. Students will be able to format output using a printer. B. Students will be able to create, store, and access data files using a DOS. C. Students will be able to demonstrate successful use of a word processing system. D. Students will be able to access a communications network system through a remote terminal, i.e., GIS, etc. E. Students will have the opportunity to visit computer installations having varied applications.

K-12 Computer Awareness Kit*

New York State Association
for
Educational Data Systems (NYSAEDS) Program

Prepared by:

Gerard Burke
Director of Computer Instruction
Half Hollow Hills School District
Dix Hills, NY 11757

Dolores Shanahan
Director of Computer Instruction
Commack School District
Commack, NY 11725

The Professional Subcommittee of NYSAEDS has designed a computer awareness kit for school districts offering beginning courses on the use of computers in education.

The kit consists of slides and a narrative intended to present computer models, hardware configurations, and optional computer applications appropriate for students in grades K-12.

It is hoped that the kit will:

Give administrators and staff a basic awareness of the functional uses of computers in the instructional process.

Act as a stimulus for staff discussion on the integration of computers in the curriculum.

Provide behavioral objectives for course offerings in computer awareness, and elementary and advanced programming workshops for the entire staff.

Illustrate the role of computer graphics and computer peripherals in computer-assisted learning.

Present possible applications of computers with handicapped, gifted, and "average" classroom learners.

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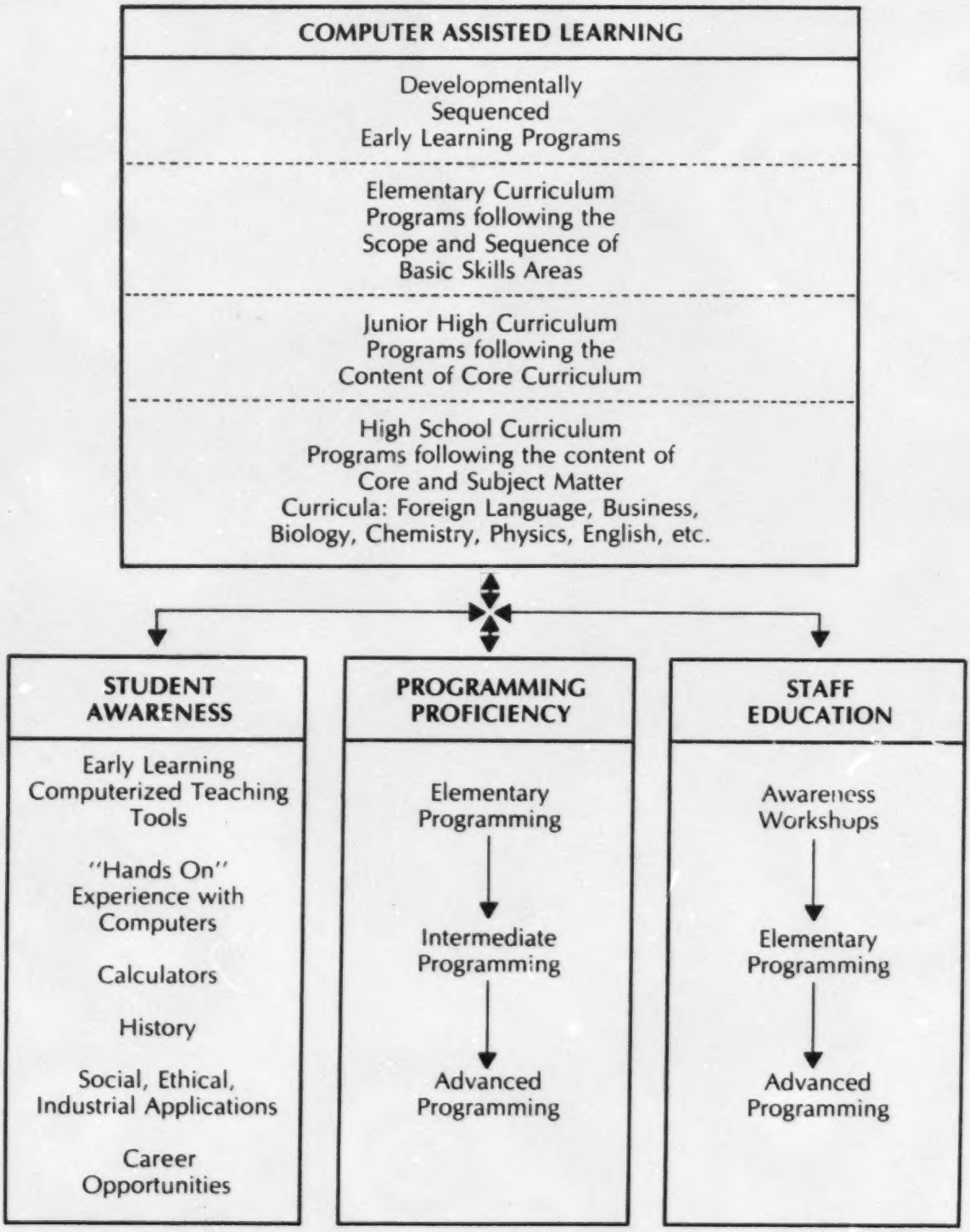
*Available at cost from:

James Will
Chairman
Mathematics Department
Dunkirk High School
Dunkirk, NY 14048

Prepared by Ms. Alice Ryan and the Computer Literacy Committee
Long Island Regional Instructional Computer Services
BOCES III, Suffolk Co., Dix Hills, NY 11746

COMPUTER EDUCATION — A MODEL


COMPUTER ASSISTED LEARNING
Developmentally Sequenced Early Learning Programs
Elementary Curriculum Programs following the Scope and Sequence of Basic Skills Areas
Junior High Curriculum Programs following the Content of Core Curriculum
High School Curriculum Programs following the content of Core and Subject Matter Curricula: Foreign Language, Business, Biology, Chemistry, Physics, English, etc.
STUDENT AWARENESS
Early Learning Computerized Teaching Tools
"Hands On" Experience with Computers
Calculators
History
Social, Ethical, Industrial Applications
Career Opportunities
PROGRAMMING PROFICIENCY
Elementary Programming
Intermediate Programming
Advanced Programming
STAFF EDUCATION
Awareness Workshops
Elementary Programming
Advanced Programming